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Zelda Music Generation using a RNN

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Abstract ABstract kommt hier hin..... was schreibt man da

Keywords Zelda · LSTM · RNN · Music · Generation

1 Introduction

Great musicians like Beethoven died before they could finish their last work. The legacy of Beethoven were 40 sketches for a 10th symphony. The project "Beethoven X - The AI Project" used AI to complete the 10th symphony using those sketches in a style that mimics the ingenuity of Beethoven [**?**].

Projects like these are the best example for a usecase for AI generated music. It is not only possible to complete given note sequences, but also to generate completly new melodies by using AI.

The beloved game series called "Zelda" by Nintendo comes with a big amount of nostalgic melodies and songs. To create new melodies in the style of those games, an AI should be trained to learn how the melodies are constructed. The goal is to let the AI generate music notes and a new melody.

2 Training Data

To train the AI, music files in any form are needed. Single instrument midi files are an easy way to train said AI. Midi (Musical Instrument Digital Interface) is a technical standard that describes a communication protocoll among other things to connect a wide variety of music instruments and other audio devices. It is used to play, edit and record music. The length, the velocity and frequency of each note is saved in a textual file format.

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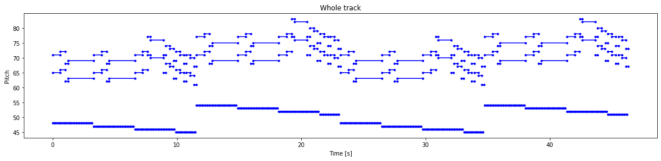

Fig. 1: Full Midi Sonng - "The Legend of Zelda - Death Mountain"

Midi files are an easy way to train an AI because of the numeric structure of the files. Websites like "BitMidi" [**?**] offer a wide variaty of free Midi files to download. 65 Single instrument songs from Zelda games were downloaded and will be used hereinafter as the training data of the AI. In Figure 1 is one of those midi songs displayed.

All music files need to be read and changed by the program to acquire a dataset for the neural network. A Long Short-Term Memory (LSTM) neural network should be used to generate new melodies. A LSTM network is able to make predictions depending on a sequence of data. In terms of music this might mean that it can predict the next note by using a given sequence of multiple notes, that were played before.

With the help of the library "PrettyMidi" the Midi data is handled. All notes from every Midi file is read and saved into an array. This array of tupels consists of the the pitch, the duration and the step of each note (step meaning the length of the pause between the note and the note being played before).

Figure 2 shows the distribution of pitch, step and duration of all notes in the song "The Legend of Zelda - Death Mountain". The usage of low notes in contrast to really high notes is one of the key elements of the music of the Zelda games. Furthermore you can see, that the duration of the notes are mostly short with only some outlier.

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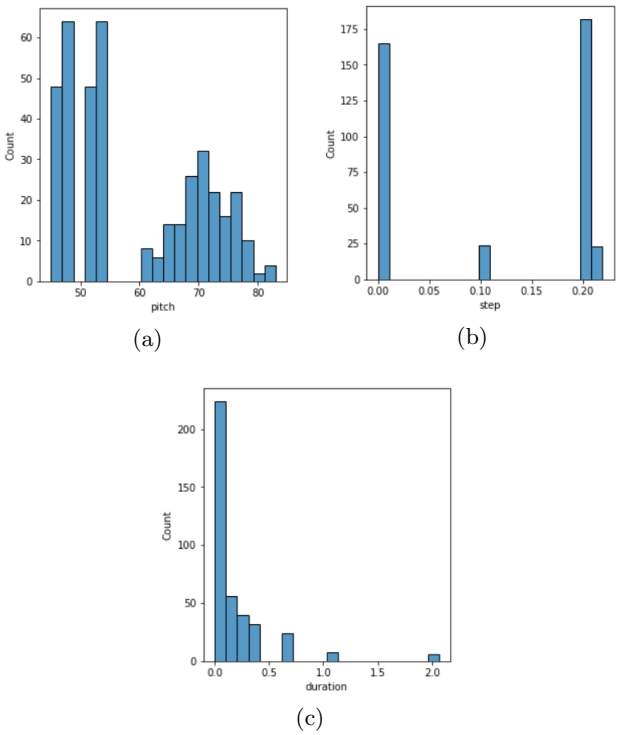

Fig. 2: Distribution of pitch, step and duration of "The Legend of Zelda - Death Mountain"

Table 1: Please write your table caption here

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- wie wierd dsa modell aufgebaut
- ausfuehren
- loss funktion
- verteilung noten vorher nachher
- conclusion

3 Section title

3.1 Subsection title

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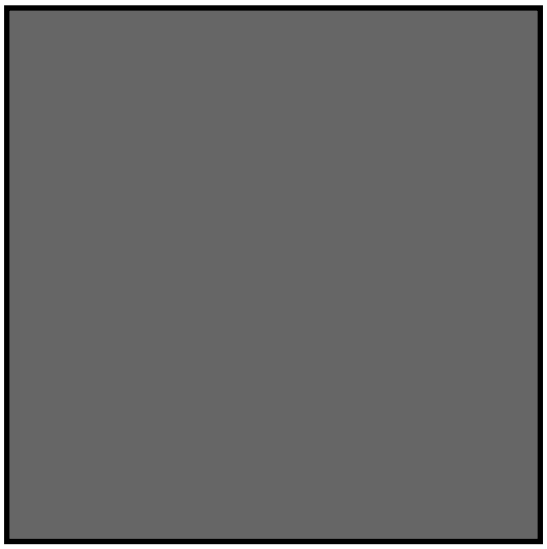
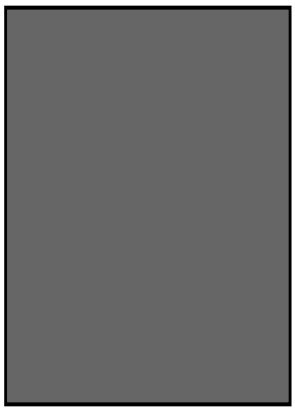


Fig. 3: Please write your figure caption here



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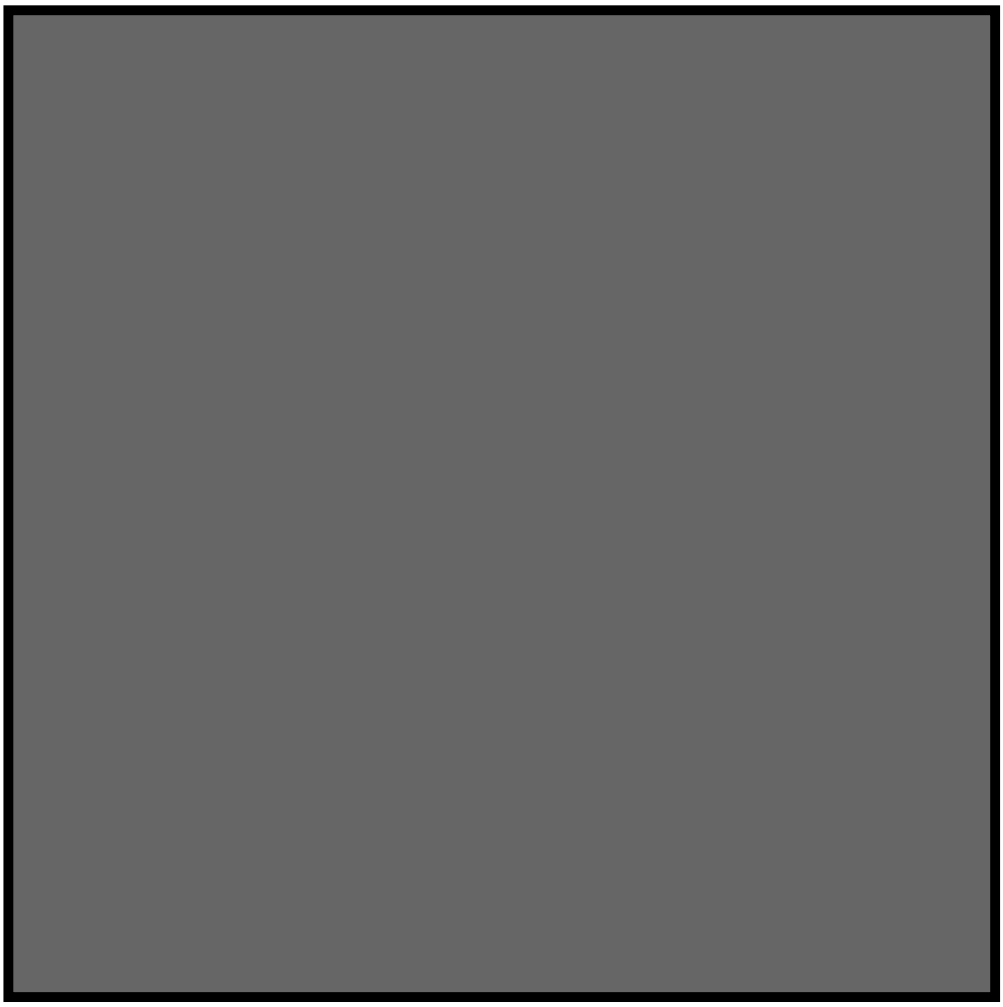

Fig. 4: Please write your figure caption here